

Appl. No. 09/663,582  
Amendment Dated: October 28, 2003  
Reply to Office action of July 30, 2003

Remarks:

Reconsideration of the application is requested. Claims 1, 3-7, 9-22, and 67-68 are now in the application. Claims 1, 5-6, and 21-22 have been amended. Claim 2 has been canceled. Claims 23-66 were previously withdrawn.

In item 4 of the above-identified Office action, the Examiner has rejected claim 9 as being indefinite under 35 U.S.C. § 112, first paragraph, as containing subject matter that was not explained in specification to enable one with ordinary skill in the art to practice the invention. More specifically, the Examiner has stated that the term "overlong" fibers was unclear. The Examiner is directed to the paragraph of the specification beginning at page 15, line 25. In particular, the Examiner is directed to page 16, line 18, through page 17, line 3. In this passage, "overlong" fibers are defined as, "Fiber bundles with a substantially greater fiber bundle length than intended for the fraction." In light of this passage of the specification, one with ordinary skill in the art would be able to practice the invention as claimed. Therefore, the rejection under 35 U.S.C. § 112, first paragraph, was not proper.

In item 6 of the Office action, the Examiner rejected claims 1-7, 9-22, and 67-68 as being indefinite under 35 U.S.C. § 112, second paragraph. More specifically, the Examiner

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pointed out that claim 1 used the transitional phrase "consisting" then claims 5 and 6 added elements beyond what was specified in claim 1. To overcome the rejection, claims 5 and 6 have been rewritten as independent claims. The independent claims 5 and 6 no longer depend on claim 1 therefore, they no longer expand on the limited group of claim 1. Accordingly, the amendments to claims 5-6 make claims 1-7, 9-22, and 67-68 definite.

In the first paragraph on page 3 of the Office action, the Examiner rejected claim 1 as being indefinite under 35 U.S.C. § 112, second paragraph. More specifically, the Examiner stated claim 1 included a phrase, "separated by a minimum."

The phrase is definite for the following reasons. In the total fiber length distribution, as exemplified in Fig. 1, the distribution graph 1 exhibits a minimum 6 separating the part of the distribution graph referring to the shorter "matrix fiber" fraction with a maximum designated by reference number 4, and the part of the distribution graph referring to the longer "reinforcing fiber" fraction with a maximum designated by reference number 5.

To make this feature more explicit in the language of the claim, claim 1 has been amended. Amended claim 1 now reads, "... said weights being plotted to a graph (1) of weight

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distribution in relation to fiber bundle length, said graph exhibiting a minimum (6) between a first part (3) of said graph relating to said reinforcing fiber bundle fraction and a second part (2) of said graph relating to said matrix fiber bundle fraction."

Therefore, in light of the amendment, the phrase "separated by a minimum" as used in claim 1 is definite. Likewise, this language has been added to now independent claims 5 and 6. Claims 21 and 22 have also been amended to reflect the amendment to their base claim. Therefore, those claims are definite as well.

In the second paragraph on page 3 of the Office action, the Examiner rejected claim 9 as being indefinite under 35 U.S.C. § 112, first paragraph. More specifically, the Examiner rejected the term "overlong" as being indefinite. The Examiner is directed to the specification, page 14, line 21, through page 15, line 11. This passage describes what overlong fibers are and how they are included in the fractions. Furthermore, this passage defines the term "overlong fiber bundles" as fibers having a length in excess of the upper length of the sieve fraction in question.

Accordingly, the claims meet the requirements of 35 U.S.C. § 112, first and second paragraphs. Should the

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Examiner find any further objectionable items, counsel would appreciate a telephone call during which the matter may be resolved. The changes are neither provided for overcoming the prior art nor do they narrow the scope of the claim for any reason related to the statutory requirements for a patent.

In item 8 of the Office action, the Examiner rejected claims 1-7, 9-22, and 67-68 as being obvious over McKee (U.S. 6,335,105) in view of Tredway et al. (U.S. 5,552,213) and Beier et al. (U.S. 6,316,086) under 35 U.S.C. § 103(a).

The rejection has been noted and the claims have been amended in an effort to define more clearly the invention of the instant application. The features of claim 2 have been added to claim 1.

Before discussing the prior art in detail, a brief review of the invention as claimed is provided. Amended claim 1 calls for, *inter alia*, a composite material having the following features:

a ceramic matrix consisting of phases of silicon, carbon, and silicon carbide; and

fiber bundles having two different fractions including a reinforcing fiber bundle fraction and a matrix fiber bundle fraction having lengths with different averages, each of said fiber bundles having a weight, said weights being proportional to said fiber bundle lengths, said weights being

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plotted to a graph of weight distribution versus fiber bundle length, said graph exhibiting a minimum between a first part of said distribution graph relating to said reinforcing fiber bundle fraction and a second part of said distribution graph relating to said matrix fiber bundle fraction;  
  
a portion of said fiber bundles having at least one protective layer. (Emphasis added by Applicants.)

McKee is directed to a substrate formed from a superalloy, a silicon-based ceramic material, and a thermally stable silicon diffusion barrier layer. The silicon-based ceramic material of this reference is a silicon/silicon carbide or a silicon/silicon carbide/carbide [sic Applicants believe that "silicon/silicon carbide/carbon" was intended] material. The material is made by infiltrating carbon fiber prepgs with molten silicon whereupon the carbon fibers are converted (mostly, but not entirely) to silicon carbide.

As previously stated, the features of claim 2 have been added to claim 1 and claim 2 has been deleted. The specification, page 11, lines 6 to 8, teaches that such protection layer shall protect the fibers from an attack when the CMC is made by siliconization, as fully described in page 23, lines 4 to 13, of the specification. The disclosure of the McKee reference teaches away from the invention of the instant application, as the consumption of the carbon fibers to form silicon carbide is an essential element of the McKee reference. Contrary to this, in the invention of the instant

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application, the fibers have a protective layer in order to make them resist the attack of the molten silicon during the infiltration and subsequent reaction. By including the fiber protection in claim 1, there is no impetus for a person skilled in the art to use the McKee reference as a primary document.

There would be no motive to combine the McKee and the Tredway references as the McKee reference relates to a combination of a superalloy and a ceramic layer, separated by a diffusion barrier. Upon a sheet of superalloy (superalloy coupons of 1/8 inch thickness, see Example 1), a thin diffusion barrier layer of 1 to 2 mm is applied, and then a ceramic layer of 10 to 20 mm. See the specification in col. 1, line 26 to 28. It is also emphasized that the superalloy part is the (mechanical) support, see col. 1, line 31: "A ceramic material can also be used ... These components need to be supported mechanically by superalloy structures." Therefore, there is no teaching as to reinforcing fibers in the McKee reference, and a person skilled in the art looking for mechanically rigid ceramic structures would not seek in the McKee reference nor combine its teaching with any other document to find mechanically rigid ceramic structures.

While the Tredway reference discloses a glass matrix composite or glass ceramic matrix composite comprising reinforcing

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fibers, which may be of different length, the primary fibers being discontinuous, and the secondary fibers being discontinuous, there is nothing in Tredway that teaches to use fibers with a protective layer. The boron nitride particles mentioned in col. 3, lines 9-12, are clearly not a coating on the fibers, but are merely present as dispersed particles. Therefore, the combination of the McKee and Tredway reference does not make obvious the invention of the instant application.

Beier (U.S. 6,316,086) is directed to a friction lining for torque transmission devices, in particular for clutches, which are based on composite materials having a matrix of glass or glass ceramics, inorganic reinforcing fibers, and one or more ceramic, vitreous, or metallic fillers. Among the inorganic fibers, carbon fibers, and silicon carbide fibers are preferred. The reinforcing fibers may also have a coating; see col. 2, lines 35 to 37.

While a person skilled in the art would easily combine the Beier and Tredway references, as both of these pertain to reinforced glass matrix or glass ceramic matrix composites, there is no motive to combine either or both of the Tredway and Beier reference with the McKee reference, as this does not pertain to glass matrix or glass ceramic matrix composites. The ceramic layer in the McKee reference serves only to

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thermally insulate the superalloy parts from the heat evolved by the turbine. As the ceramic layer of McKee has no mechanical function, a person skilled in the art would not combine the teachings of McKee with documents relating to structural ceramics, i.e., those that serve a mechanical or load bearing function.

The combination of the Tredway and Beier references on the one hand, and the McKee reference on the other hand is therefore clearly based on hindsight.

Accordingly, none of the references, whether taken alone or in any combination, either show or suggest the features of claim 1. Therefore, claim 1 is patentable over the art. Moreover, because all of the dependent claims are ultimately dependent on claim 1, they are believed to be patentable as well.

In view of the foregoing, reconsideration and allowance of claims 1, 3-7, 9-22, and 67-68 are solicited.

If the Examiner is not persuaded by the amendments and remarks, a teleconference with the Examiner is requested.

If an extension of time for this paper is required, petition for extension is herewith made.

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Please charge any other fees that might be due with respect to  
Sections 1.16 and 1.17 to the Deposit Account of Lerner and  
Greenberg, P.A., No. 12-1099.

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Respectfully submitted,

  
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